

Technical News Bulletin

of the
National Bureau of Standards

★ Issued Monthly ★

Washington

July 1944¹

Number 327

CONTENTS

	Page		Page
Plastics through the looking glass.....	40	Permeability of concrete to kerosine.....	52
Textile Research headquarters at Princeton, N. J.....	50	Fire hazards of paints on metal.....	52
Properties of bearing aids.....	50	Short-time tests of solders and soldered joints.....	53
A daily record of ultraviolet solar and sky radiation.....	50	Standardization of the salt-spray corrosion test.....	53
Thermodynamic properties of cis-2-butene.....	51	Technical cohesive strength of some steels and light alloys at low temperatures.....	54
Specific heat and entropy of synthetic rubber GR-8.....	51	Twenty-second annual conference of State Utility Commission Engineers.....	54
Synthesis of vitamin C from pectic substances.....	51	New and revised publications issued during June 1944.....	55
Dipole moment and structure of trioxane.....	52	Mimeographed material: Letter Circulars.....	55
Reactivity of aggregate constituents in alkaline solutions.....	52	Recent articles by members of the Bureau's staff published in outside journals.....	56

PLASTICS THROUGH THE LOOKING GLASS

An unusual treatment of a fascinating subject is an article in the June 10 number of Chemical and Engineering News, entitled "The Chemists' Wonderland," in which Gordon M. Kline, chief of the Bureau's plastics section, takes as his theme the analogies in "the Wonderland and Looking-Glass world of Alice's dreams to the realm of high polymer chemistry, typified by the plastics industry of today." Although it is essential that the public understand the limitations as well as the astonishing versatility of these new synthetics, a mere listing of present-day types as compared with those available less than 20 years ago makes one agree with the Queen when she told Alice "Now, *here*, you see, it takes all the running *you* can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!" Likewise, there is no difficulty in finding plenty to talk about, in applications of plastics, under any of the five subjects "of shoes—and ships—and sealing wax—of cabbages—and kings." A partial list of

manufacturing groups that are consumers of plastics indicates many other ramifications in the uses for these materials. It is evident that to the animal, vegetable, and mineral kingdoms of previous centuries has now been added another—the synthetic kingdom—and that in the list of materials of construction—metal, wood, concrete—there is now a new name—plastics.

A review of the manifold military applications of plastics forms a most interesting portion of the article. Future applications, as we may become familiar with them in the Looking Glass world of tomorrow, are shown to require almost a belief in the impossible—an attitude exactly like that of the White Queen, who answered Alice's apparently sensible statement "One *can't* believe impossible things" with the remark, "I daresay you haven't had much practice. When I was your age, I always did it for half-an-hour a day. Why sometimes I've believed as many as six impossible things before breakfast."

With this approach not only six, but dozens of useful and beautiful things are visualized as contributions of plastics to better living. A scratch-resist-

¹ Published with approval of the Director of the Budget.

ant, nonfragile, heat-stable, weather-proof, transparent product—the result of the discovery by some chemist of the proper copolymer of styrene, methyl methacrylate, or other relatively simple compound with a cross-linking elastomeric monomer—can be expected. The low-pressure molding process developed during the present war to turn out helmet liners, aircraft and radio parts, small boats, and binocular cases may give us compact bath and kitchen units, light but strong furniture, economical two-seater utility automobiles, and the light, tough, sound-absorbing structure of the family helicopter. "One thing is certain! The war applications of plastics have been amazing in scope but drab in aspect. The plastics of tomorrow will herald the return of spring to a color-starved world."

Having discussed types, present applications, and the probable future of plastics, Dr. Kline closes with the advice that Father William gave to the young man: "I have answered three questions, and that is enough," said his father: "don't give yourself airs! Do you think I can listen all day to such stuff? Be off, or I'll kick you down stairs!"

TEXTILE RESEARCH HEADQUARTERS AT PRINCETON, N. J.

An important step in the establishment of a central research organization for the whole textile industry was taken during May. The Textile Research Institute, Inc., purchased $5\frac{1}{2}$ acres of land and an 18-room building at Princeton, N. J., to house its fundamental research laboratories, a textile library, and a graduate training program. It was announced that the research staff of the Textile Foundation, which has been located at the Bureau for 6 years, will move to this building as soon as it can be suitably equipped, and will serve as the fundamental research staff of the Institute as well as of the Textile Foundation, under the direction of Dr. Milton Harris. Its activities will be aided by an advisory committee of outstanding scientists. The graduate training program will involve the training of a few picked college graduates each year for masters' or doctors' degrees in chemistry, physics, chemical engineering, etc., with textile specialization, using the facilities of Princeton University. Graduates must meet Princeton and Institute requirements and will be available for important positions in the textile industry.

Arrangements have also been made for the applied research work of the Institute under the direction of Giles E. Hopkins to take up quarters in laboratories to be leased from the Princeton Engineering School. Work will be conducted there, with the use elsewhere of such specialized facilities as may be needed.

PROPERTIES OF HEARING AIDS

Hearing-aid devices for amplifying sound are coming into wide use. After an otologist measures the hearing loss, at various frequencies, of an individual, he tries to select a hearing aid that will compensate for the deficiency in hearing. If the patient has a large loss at high frequencies, a hearing aid is chosen that has a high gain at such frequencies.

Obviously, it is necessary to have a scheme for measuring the gain of hearing aids at various frequencies. The Bureau's sound section has a method for measuring gain, in which the transmitter of the hearing aid is placed in front of a standard source of sound. The receiver of the hearing aid then produces sound in a small cavity resembling the average ear canal, and the amount of the sound is measured with a standard microphone.

Such measurements of gain are being made frequently for the Veterans' Administration. The behavior of tone controls and the battery drains of hearing aids are also investigated.

The hearing-aid field is a highly competitive one in which there are numerous manufacturers. Recently exaggerated claims by one maker prompted the Federal Trade Commission to have samples of his product measured for gain and other characteristics at the Bureau. The results of these measurements showed clearly the extent of the exaggeration.

The science of measuring hearing aids is still in a state of flux, and numerous acoustics laboratories, besides the Bureau's, are conducting research on the problem.

A DAILY RECORD OF ULTRAVIOLET SOLAR AND SKY RADIATION

In the July Journal of Research (RP-1593), W. W. Coblenz describes a photoelectric ultraviolet intensity meter and automatic integrating and recording apparatus for measuring the biologically effective component of ultraviolet radia-

tion,
from
on a
mete
stan
desc
(Jul
data
of t
biolo
and
peri
in v
mon
ultra
min
give
the
ultra
3133
sun
from
cent
abo
of c
the
men
the
of
clin

TH

C
one
occu
inve
dier
edge
of f
ling
ing
Cis
per
frec
tion
gus
rep
of
cis-
gre
The
ure
tem
of
-7
tab
rive
etr
calc
and
ics.
cis-
rel
cis-
rub

tion, of wavelengths 3132 Å and shorter, from the sun and the entire sky, incident on a horizontal plane, under various meteorological conditions. Methods of standardization, in absolute value, are described (J. Research NBS 30, 435 (June 1943) RP1542 and supplementary data). A continuous graphical record of the integrated daily total amount of biologically effective ultraviolet solar and sky radiation, observed during a period of almost 3 years (1941 to 1943), in Washington, D. C., is given. The monthly totals of biologically effective ultraviolet, in absolute value (milliwatt minutes per square centimeter) are also given graphically. On the clearest days the biologically effective component of ultraviolet radiation, of wavelengths 3132 Å and shorter, incident from the sun and the whole sky, at midday, ranges from about 180 microwatts per square centimeter ($\mu\text{W}/\text{cm}^2$) in midsummer to about 30 $\mu\text{W}/\text{cm}^2$ in midwinter. A series of erythema tests is given, correlating the physical (radiometric) measurements with the physiological reaction of the untanned skin, which information is of interest in heliotherapy and bioclimatology.

THERMODYNAMIC PROPERTIES OF CIS-2-BUTENE

Cis-2-butene ($\text{H}_3\text{C}.\text{CH}:\text{CH}.\text{CH}_3$) is one of the hydrocarbon compounds that occur in some of the chemical reactions involved in the manufacture of butadiene for synthetic rubber. A knowledge of the thermodynamic properties of these compounds is useful in controlling these chemical reactions and in testing the purity of the final products. *Cis*-2-butene is a gas at ordinary temperature. It boils at $+3.7^\circ\text{C}$ and freezes at -138.9°C . In an investigation by Russell B. Scott, W. Julian Ferguson, and Ferdinand G. Brickwedde, reported as RP1592 in the July Journal of Research, the specific heat of solid *cis*-2-butene was measured from 15 degrees absolute up to its melting point. The specific heat of the liquid was measured from the melting point to room temperature. Vapor pressure and heats of vaporization were measured between -78°C and $+13^\circ\text{C}$. Using these data, tables of thermodynamic properties derived from the low temperature calorimetric data were extended to $1,200^\circ\text{C}$ by calculations using spectroscopic data and the methods of statistical mechanics. The extent of the conversion of *cis*-2-butene to *trans*-2-butene, a closely related compound, also involved, with *cis*-2-butene in the making of synthetic rubber, was calculated.

SPECIFIC HEAT AND ENTROPY OF SYNTHETIC RUBBER GR-S

Because the synthetic rubber GR-S (Government rubber-styrene type), which is the copolymer of butadiene and styrene, is the type of synthetic rubber being produced in much the largest quantity, this material was included in the Bureau's program of determining basic thermodynamic properties of natural and synthetic rubber and of the components from which they are made. This program, which was initiated more than 10 years ago, has already included work on natural rubber, isoprene, and Hycar OR-15 synthetic rubber. Data obtained from these studies are needed in calculations having to do with: (1) chemical reactions in the manufacture of the monomers, (2) the reactions of polymerization, and (3) vulcanization and other reactions involving the polymerized material.

In the July issue of the Journal of Research (RP1595), R. D. Rands, Jr., W. J. Ferguson, and J. L. Prather describe measurements of specific heat on the synthetic rubber GR-S from -258°C (15°K) to about 60°C . The specific heat at 25°C was found to be 1.894 international joules. $\text{gram}^{-1}.\text{degree}^{-1}$. A second-order transition, one which involves a marked change in the specific heat over a short temperature range, was discovered at about -61°C . Similar transitions have been found in Hycar OR-15 synthetic rubber at about -23°C , and in natural rubber at -70°C . It seems evident that the specific heat values just below the transition, and the transition temperature itself, depend on the thermal treatment of the sample.

The increase in entropy of the sample of GR-S studied from the absolute zero of temperature to 25°C was calculated to be 1.824 international joules. $\text{gram}^{-1}.\text{degree}^{-1}$.

SYNTHESIS OF VITAMIN C FROM PECTIC SUBSTANCES

Inasmuch as vitamin C deficiency retards the healing of wounds, and administration of vitamin C has been found to promote wound healing, a large demand for this substance has been created by the needs of the military forces. Although the vitamin is present in small quantities in fruits and vegetables, this source is not adequate and must be supplemented by the synthetic vitamin. The process now in use for the synthesis of vitamin C is long and complicated.

Since in many plant materials vitamin C is associated with pectin, it seemed

probable that a relation exists between galacturonic acid, the structural unit of the pectins, and vitamin C. Galacturonic acid, one of the more abundant plant materials, in the form of pectic substances comprises approximately 30 percent of the dry pulp which remains after extraction of sugar from sugar beets, and a large part of the pulp of citrus fruits and apples. Since the annual production of sugar beets alone is approximately 7,000,000 tons, there is an almost unlimited source of material suitable for the preparation of galacturonic acid.

For these reasons the preparation of vitamin C from beet pulp was investigated at the Bureau, by Horace S. Isbell, and a new process for the preparation of vitamin C was worked out. The pulp is treated with a commercial pectinase; the resulting galacturonic acid is separated either in the form of sodium calcium galacturonate, or sodium strontium galacturonate. The salts are reduced to salts of L-galactonic acid, which are converted to 2-keto-L-galactonic acid. The latter is lactonized and enolized to yield ascorbic acid (vitamin C).

As explained in the report on this work in the July Journal of Research (RP 1594), a number of crystalline salts of galacturonic acid were prepared. 2-keto-L-galactonic acid and methyl 2-keto-L-galactonate were obtained in the crystalline state, and it was established that 2-keto-L-galactonic acid on lactonization and enolization yields vitamin C, rather than an isomer thereof. Electronic Interpretations are presented for the conversion of methyl 2-keto-L-galactonate to ascorbic acid by basic catalysts, for the lactonization and enolization of 2-keto-hexonic acids by acid catalysts, and for the formation of furfural and reductive acids from pentoses, galacturonic acid, and ascorbic acid.

DIPOLE MOMENT AND STRUCTURE OF TRIOXANE

Trioxane is a solid polymer of formaldehyde resembling the well-known solvent dioxane in its chemical properties. A. A. Maryott and S. F. Acree state in the Journal of Research for July (RP1596) that it is possible for the molecule to exist in two spacially different forms resembling a chair and a cradle, for which the theoretical dipole moments are 2.3 and 0.6×10^{-18} esu, respectively. The experimental value in benzene was found to be 2.18×10^{-18} esu. Hence, the authors conclude that ordinary trioxane is largely in the chair form, possibly in equilibrium with a small amount of the cradle form. This

cyclic ether would therefore be suitable for mixing with nonpolar solvents to study the effect of increased polarity on the activities and absorption spectra of indicators.

REACTIVITY OF AGGREGATE CONSTITUENTS IN ALKALINE SOLUTIONS

A type of concrete failure observed in several areas in this country is now believed to be caused by excessive expansion due to reaction between certain types of rocks used as aggregates and the alkalies present in varying amounts in portland cement. The cause and the mechanism of this reaction are the subject of a study at the Bureau. As a part of this work, a paper prepared by Leonard Bean and J. J. Tregoning for publication in the Journal of the American Concrete Institute gives the results of an investigation of the reactivity of various types of rocks and minerals in alkaline solutions. For example, in an accelerated test at 122° C, in which the aggregate constituents were in contact with alkali hydroxide solutions, the order of reactivity was found to be as follows: Opal, chalcedony, pitchstone, rhyolite, basalt, magnesite, obsidian, calcite, limestone, dolomite, microcline, and oligoclase. The reactivities of these aggregate materials in hydroxide and hydroxide plus carbonate solutions at 21° C fall in about the same order as in the accelerated test.

PERMEABILITY OF CONCRETE TO KEROSENE

An error occurs in the item under this heading on page 35 of Technical News Bulletin No. 325 (May 1944). It is stated that "powdered iron-type admixtures in the mortar coat reduced oil penetration, and one magnesium oxychloride type of coating looks promising if used where exposure to drying or to water is not excessive." This should read: "Powdered iron-type admixtures in the mortar coat did not reduce oil penetration; whereas one magnesium oxychloride type of coating looked promising if used where exposure to drying and to water is not excessive."

FIRE HAZARDS OF PAINTS ON METAL

The degree to which paint coatings on metal contribute to the hazards from fire has been the subject of tests recently completed by S. H. Ingberg, chief of the Bureau's fire resistance section. While a single paint coat is only about 0.001

inch thick, successive applications, such as on ships, may build up a coating of considerable thickness. It was found that the hazard increases with thickness of coating because of the greater amount of fuel and more ready spread of fire. Paint coatings after normal aging, involving evaporation of solvents and oxidation of the film-forming oils, will burn with difficulty on metal unless the coating is heavy. This is because of the high ignition temperatures of the paint film and the retarding effect of an incombustible base on the burning of any thin veneer attached thereto. For coating thicknesses as high as 0.05 inch, representing some 50 brush coats, paint coatings will burn and contribute to the spread of fire.

The explosion hazard from burning and heating of paint on hot plates was found to be minor on account of the small volume of combustible gases given off, mainly carbon monoxide, in comparison with the amounts of carbon dioxide and water vapor. The lower explosive limits of carbon monoxide is high—about 12 percent—and the self-ignition temperature is also high—above 600° C.

There are, however, imminent possibilities of toxic hazards, since concentrations of the monoxide of no more than 0.10 percent are objectionable from this standpoint. The same applies to fires in ordinary combustible solids and liquids in ship compartments, since there is seldom sufficient air present or supplied by the ventilation system to burn them completely. Hence larger volumes of toxic gaseous products of incomplete combustion will be formed than for fires in more open spaces.

SHORT-TIME TESTS OF SOLDERES AND SOLDERED JOINTS

A series of short-time tests of 13 solders, mostly in the low-tin category, has been completed by J. A. Kies and W. F. Roeser of the Bureau's Metallurgy Division. It was evident that modification of the tin-lead compositions by additions of small amounts of bismuth, antimony, silver, and copper made little difference in the shear strength of soldered joints at room temperature, although spreading was improved in some cases. The scarf joint was found to possess definite advantages for test purposes. The effects of five variables on the short-time strength of soldered joints were investigated for the purpose of obtaining essential data which are considered useful in establishing standard procedures for making these short-time tests.

STANDARDIZATION OF THE SALT-SPRAY CORROSION TEST

For more than 25 years the salt-spray corrosion test has been used in the Bureau's laboratories, and its limitations as well as its merits have become well recognized. During the past 2 years, however, its use has greatly increased, particularly in connection with the testing of vast quantities of supplies sent to the Pacific war area. Much of this testing has been done by inexperienced workers and with equipment of doubtful suitability. The vast quantities of foods and other supplies sent to the military forces cannot be given the care in shipment or in storage that they would receive under normal circumstances. Corrosion in a marine environment is always rapid. Hence, the need for a test that can be used in the initial inspection of supplies to insure adequate protective surface treatment of all packing containers, especially those of foods and other perishable goods. The salt spray is the best and most practicable test that has been devised for such a use, but the results obtained in different inspection laboratories have been extremely variant and disappointing.

In order to improve this situation and to standardize the test conditions, a special informal committee, composed of representatives of interested Government agencies and of industry, has exhaustively surveyed this matter. Three meetings have been held during the past 3 months, the latter two at the Bureau under the auspices of the Division of Metallurgy. At the third meeting, held during May, agreement was reached on the basic requirements of a master specification for salt-spray testing procedure, and the incorporation of the features agreed upon into all working specifications is now practically assured. The most helpful feature on which agreement was reached is a practicable method for determining the density of the fog; need for this has long been recognized, but attempts to accomplish something workable have hitherto been unsuccessful. The present method is based essentially on the measurement of the rate of condensation of the mist into collectors of specified size and other characteristics. If all workers in this field use a solution of specified concentration and other characteristics, and maintain a prescribed temperature within the spray-test chamber (which is filled with a fog or mist so as to produce a prescribed "fog density"), consistent and dependable results can be

expected regardless of other less important conditions resulting from differences in apparatus or other causes. A paper entitled "Basic Requirements in the Standardization of the Salt Spray Test," embodying the results of this study, was presented by L. J. Waldron of the Bureau at the June meeting of the American Society for Testing Materials.

TECHNICAL COHESIVE STRENGTH OF SOME STEELS AND LIGHT ALLOYS AT LOW TEMPERATURES

An investigation has been made by D. J. McAdam of the Bureau's Metallurgy Division to determine the technical cohesive strength of a high-carbon steel, a stainless steel, duralumin, and magnesium alloys. Tension tests of notched and unnotched specimens have been made at room temperature and at selected low temperatures down to that of liquid air. Diagrams have been constructed to show the influence of notch depth, notch angle, and root radius on strength and ductility. A study is thus made of the influence of the ratio of radial to axial stress on the technical cohesion limit and the influence of plastic deformation, heat treatment, and temperature on technical cohesive strength. Diagrams have also been constructed to show the quantitative variation of strength and ductility with temperature. A report on this work was presented at the June meeting of the American Society for Testing Materials, and will later appear in the Proceedings of that organization.

TWENTY-SECOND ANNUAL CONFERENCE OF STATE UTILITY COMMISSION ENGINEERS

The Twenty-Second Annual Conference of State Utility Commission Engineers was held at the Mayfair Hotel in St. Louis, May 17-19, under the chairmanship of Orrin S. Vogel, of the Georgia Public Service Commission. Forty-two engineers attended as representatives of 22 States, the District of Columbia, and the Federal Government. The Bureau was represented by Richard L. Lloyd, secretary of the conference.

The following technical papers were presented and discussed: Highlights of the 1943 National Association of Railroad and Utilities Commissioners' war conference of interest to the engineer, R. E. Duffy, Missouri; Current methods and trends in utility valuation and tax-

ation, P. L. Holland, Maryland, presented by E. Irvine Rudd, Connecticut; Storing gas in liquefied form, The East Ohio Gas Company, presented by O. F. Foster, Ohio; Derivation of figures used to find a rate base, E. Irvine Rudd, Connecticut; A review of the jurisdiction of the Federal Power Commission, Chas. V. Shannon, FPC; Application of salesmanship in handling informal complaints, C. J. Reid, Ohio, presented by J. L. Doyle, Ohio; Depreciation and the rate base from the standpoint of the engineer, Warren Oakey, Wisconsin; Government loan to assist small rural telephone companies to rehabilitate their rural systems, B. Richardson, Oklahoma.

The Executive Committee appointed a Policy Committee, a Nominating Committee, and a Program Committee for next year consisting of the following members: Policy Committee—E. I. Rudd, Connecticut, chairman; W. E. Limbocker, Kansas; H. J. Wagner, West Virginia; H. L. Gerrish, Maine; L. J. Rills, New Hampshire; A. E. Davison, Ontario. Nominating Committee—C. B. Hayden, Wisconsin, chairman; G. Charlesworth, Iowa; E. H. Morris, West Virginia; G. R. Johnson, Pennsylvania; R. E. Duffy, Missouri; O. S. Vogel, Georgia (ex officio). Program Committee—H. L. Gerrish, Maine, chairman; W. Oakey, Wisconsin; E. F. Carter, New Mexico; W. H. Cobb, Arkansas; S. White, Tennessee.

The Policy Committee reported, among others, the following recommendations, which were adopted without dissenting vote: (1) That there shall be held a conference of State Utility Commission Engineers in May or June 1945; (2) that said conference shall be a 3-day meeting. The location of the conference and the dates thereof shall be determined by the Executive Committee; (3) that membership in the conference shall be limited to engineers of the utility regulatory agencies of the level of State or higher jurisdictions, and the National Bureau of Standards; (4) that the governing body of the conference shall be the executive committee. Any matters affecting the conference arising between meetings of the conference shall be decided by the executive committee; (5) that the executive committee shall consist of the chairman and vice chairman of the conference and four other members of the conference, one of whom shall be the secretary of the conference; (6) that the secretary of the conference shall continue to be a representative of the National Bureau of Standards; (11)

that it shall be the duty of the program committee to select subjects for discussion at the succeeding conference, designate the authors thereof, and arrange for the delivery of the papers at the conference; (12) that the authors of papers shall be members of the conference, except that the Executive Committee may permit one paper by an author not a member of the conference; (13) that the chairman of the conference shall inform the General Solicitor of the National Association of Railroad and Utilities Commissioners that the Executive Committee stands ready and willing to recommend appropriate engineering personnel for appointment on the technical committees of the NARUC.

On recommendation of the Nominating Committee, the following members of the Executive Committee were elected for the next conference: O. F. Foster, Ohio, chairman; J. G. Hunter, California, vice chairman; W. Kemp Walker, Oklahoma; H. W. Abbett, Indiana; H. W. Cargo, Nebraska; R. L. Lloyd, National Bureau of Standards, secretary.

Following the presentation of the papers, the question of location of next year's conference was discussed. Because of the crowded condition existing in Washington during the past few years, it was thought advisable to consider an alternate location for the conference. The suggestion of Atlanta, Ga., met with the approval of most of those present.

In considering a means of maintaining a permanent and continuing set of depreciation records for utility equipment, it was suggested that a proposal be made to the Bureau that it serve as archivist for such records. The chairman of the Executive Committee and the secretary were instructed to inquire into this matter.

NEW AND REVISED PUBLICATIONS ISSUED DURING JUNE 1944

Journal of Research²

Title page, corrections, and contents for Journal of Research, volume 31 (RP

² Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Subscription to Technical News Bulletin, 50 cents a year; Journal of Research, \$3.50 a year (to addresses in the United States and its possessions and in countries extending the franking privilege); other countries, 70 cents and \$4.50, respectively.

1545 to RP1569, inclusive). Price 5 cents.

Research Papers²

[Reprints from April 1944 Journal of Research]

RP1580. Effect of sodium chloride on the pH of *p*-phenolsulfonate buffers from 0° to 60° C. Roger G. Bates and S. F. Acree. Price 10 cents.

RP1581. Thermal expansion of high-silicon cast iron. Peter Hidnert and George Dickson. Price 5 cents.

RP1582. Analytical determination of aromatic hydrocarbons by adsorption. Beveridge J. Mair and Alphonse F. Forziati. Price 10 cents.

RP1583. Separation and recovery of aromatic hydrocarbons from paraffins and naphthenes by adsorption. Beveridge J. Mair and Alphonse F. Forziati. Price 10 cents.

Circular²

Supplement to National Bureau of Standards Circular C308. Standard samples issued or in preparation by the National Bureau of Standards. (May 1, 1944.) Free on application to the Bureau.

Simplified Practice Recommendation²

R203-44. Containers and packages for household insecticides (Liquid spray type). Price 5 cents.

Technical News Bulletin²

Technical News Bulletin No. 326, June 1944. Price 5 cents. Annual subscription, 50 cents.

MIMEOGRAPHED MATERIAL

Letter Circulars

[Letter Circulars are prepared to answer specific inquiries addressed to the National Bureau of Standards and are sent only on request to persons having a definite need for the information. The Bureau cannot undertake to supply lists or complete sets of Letter Circulars or send copies automatically as issued]

LC751. Methods of using standard frequencies broadcast by radio. (Supersedes LC731.)

LC752. Control of humidity by saturated salt solutions.

LC753. Polishes. (Supersedes LC275.)

LC754. Sweeping compounds (also known as "Floor Sweep" and "Dust Down"). (Supersedes LC340.)

**RECENT ARTICLES BY MEMBERS
OF THE BUREAU'S STAFF PUBLISHED
IN OUTSIDE JOURNALS²**

Coatings useful for distribution systems.

Kirk H. Logan. Am. Gas Assn. Monthly (420 Lexington Ave., New York 17, N. Y.) 26, No. 5, 226 (May 1944).

The psychophysics of color. Staff of photometry and colorimetry section.

² These publications are not obtainable from the Government, unless otherwise stated. Requests should be sent direct to the publishers.

Chapter 6, Report of the OSA Committee on Colorimetry, J. Optical Soc. Am. (57 East 55th St., New York 22, N. Y.) 34, 245 (May 1944).

Physics of light radiation. W. W. Co-blentz. Chapter 2 in book entitled Radiation and Climatic Therapy of Chronic Pulmonary Diseases, edited by Edgar Mayer (Williams & Wilkins Co., Baltimore, Md.) (June 1944).

Simplified practice in long-view planning. Edwin W. Ely. Detroit Purchaser (310 Stephenson Building, Detroit 2, Mich.) 26, No. 5, 82 (May 1944).

l.
a.
N.
-
d
of
d
as
-
r-
e-
y